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Local and Universal*

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Cuetos and Mitchell 1988, and much subsequent work, report that speakers of different languages differ in Relative Clause attachment preferences in complex NPs. These findings challenged universal theories of processing and in particular the universality of locality in parsing. In this paper, I argue that asymmetries in attachment preference stem from a previously unnoticed grammatical distinction: the availability of Pseudo Relatives. Drawing on previous data and novel results, I conclude that Locality is a genuine universal principle of processing.

*To Luigi,
A small contribution to a beautiful theory of locality*

1. Introduction

Relativized Minimality (Rizzi 1990, 2004, Starke 2001, Grillo 2008) has clear homologues in the psycholinguistic literature, where principles of locality have been shown to regulate both structure building and filler-gap processes (Right Attachment, Kimball 1973; Late Closure, Frazier 1979; Minimal Chain Principle, De Vincenzi 1991; Recency, Gibson 1991; Merge Right, Phillips 1996).

Yet, this picture is not exempt from problems: there is one domain of research in which locality has been claimed not to apply universally. Cuetos and Mitchell (1988) and much subsequent work show that speakers of different languages differ in Relative Clause attachment preferences in complex NP of the form NP1 P NP2: Low Attachment (LA) is found in English (but also Romanian and Basque a.o.), cf. (1a), and High Attachment (HA) in Spanish (and Italian, Dutch, Japanese a.o.),² cf. (1b).

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² These findings generated a huge amount of literature in the past twenty years: Cuetos & Mitchell (1988); Mitchell & Cuetos (1991); Mitchell & Brysbaert (1998); Mitchell, Brysbaert & Swanepoel

- (1) a. I saw the son₁ of the man₂ that EC₂ was running
 b. Vi al hijo₁ del hombre₂ que EC₁ corría

This variation across languages is accompanied by variation *across syntactic structures* within the same language. Hemforth et al. (submitted), for example, show that Spanish speakers demonstrate LA preference with complex NPs in subject position, e.g. in (2b):

- (2) a. Alguien disparó contra la criada₁ de la actriz₂ que EC₁ estaba en el balcón.
Someone shot the maid of the actress that was on the balcony
 b. La criada₁ de la actriz₂ que EC₂ estaba en el balcón es rubia.
The maid of the actress that EC was-sitting on the balcony is blonde

These findings, which are at odds with the otherwise uniform Local Attachment preference found for other structures in the same languages (e.g. PPs, Phillips & Gibson 1997), led to question the universality of locality in processing and, as a consequence, of the very existence of universal principles of parsing. These doubts, in turn, raise important theoretical problems with respect to a theory of language acquisition. With reference to acquisition, Fodor (1998) pointed out that:

The whole explanatory project (based on the hypothesis) that the processing mechanism is fully innate and applies differently to different languages only to the extent that their grammars differ) is in peril because of the discovery that Late Closure³ is not universal.

This situation is made even more problematic by the observation that attachment preferences and frequency of attachment do not correlate in an obvious way (Gibson, Schütze & Salomon, 1996; Augurzky, 2006 for discussion).

Several syntactic (type of P, position of complex NP, Nominal vs. Clausal context) and prosodic (length of RC, lengthening of tonic syllable in NP2, duration of prosodic breaks) factors have been shown to influence attachment, and several accounts have been proposed to explain this variation (e.g. the Tuning Hypothesis, Brysbaert & Mitchell 1996; Construal, Gilboy et al. 1995, Frazier & Clifton 1996; Predicate Proximity, Gibson et al. 1996; Anaphoric Binding, Hemforth et al. 1998, 2000b,a, Konieczny & Hemforth 2000; Implicit Prosody, Fodor 1998a,b; and much related work). The literature on the topic is extremely

(2000); Brysbaert & Mitchell (1996); Carreiras & Clifton (1993, 1999); De Vincenzi & Job (1993, 1995); Gilboy, Sopena, Clifton & Frazier (1995); Gibson, Pearlmutter, Canseco-Gonzalez & Hickok (1996); Gibson, Pearlmutter & Torrens (1999); Gibson & Schütze (1999); Phillips & Gibson (1997); Kamide & Mitchell (1997); Hemforth, Konieczny, Scheepers & Strube (1998); Hemforth, Konieczny & Scheepers (2000b,a); Hemforth, Konieczny, Seelig & Walter (2000c); Konieczny, Hemforth, Scheepers & Strube (1997); Konieczny & Hemforth (2000); Miyamoto (1999); Miyamoto, Nakamura & Takahashi (2005); Fodor (1998a,b, 2002); Fernández (2003); M.Fernández, Bradley, Igoa & Teira (2003); Fernández, Fodor, de Almeida, Bradley & Quinn (2003); Fern_andez & Bradley (2004a); Lourenço-Gomes (2005); Maia, Costa, Fernández & Lourenço-Gomes (2004); Maia & Maia (2001); Maia et al. (2004); Desmet, Brysbaert & Baecke (2002); Augurzky (2005); Lovrić (2003); Sekerina (1997, 2004); Sekerina, Petrova & Fernández (2003); Fraga, García-Orza & Acuña (2005); Wijnen (1998, 2004), among many others.

³ *Late Closure*: When possible, attach incoming lexical items into the clause or phrase currently being processed.

vast and it's beyond the scope and the goals of the present paper to present it and discuss it. Excellent reviews can be found in Fernandez (2003) and Augurzky (2006).⁴

The main aim of this paper is to offer a solution to this problem. The solution stems from the recognition of a previously unnoticed grammatical distinction between the languages and structures under consideration: the availability of Pseudo Relatives. In section 2 I briefly discuss some core properties that distinguish Pseudo Relatives (PR) from genuine Relative Clauses. In section 3 I propose that the availability of PRs (combined with Minimal Attachment) accounts for the observed variation in parsing preferences both across languages and syntactic structures. In the remainder of section 3, I provide evidence for the proposed account based on both previous results and novel experimental findings from the Psycholinguistics Lab at CLUNL (Grillo & Costa 2012; Grillo, Fernandes & Costa 2012).

2. Not all Cs are created equal

A standard assumption in the literature on RC attachment is that 1(a) and 1(b) are equivalent and both two way ambiguous, i.e. that English *that* and Spanish (or Italian/French/Dutch) *que/che/qui/die* are *essentially equal* in their function. Assuming identity at the grammatical level necessarily puts all the burden of explanation of the existing variation on the parser, and generates the problems mentioned above for a theory of universals in parsing.

Importantly, however, this assumption is wrong: the syntactic properties of English *that* are not the same as those of Italian *che* or Spanish *que*. In fact, despite their obvious similarities, a careful analysis will reveal that the Italian and the Spanish Cs are also not equal to each other. The English 1(a) is two-way ambiguous in that the RC introduced by *that* can be attached both to NP1 and NP2. The Spanish “counterpart” 1(b), however, is three-way ambiguous: as in the English sentence, *que* can introduce a RC attaching either to NP1 or NP2, but in addition, *que* can also introduce a Pseudo Relative which attaches to V and *obligatorily* takes NP1 as its subject.⁵

2.1 Pseudo Relatives

Pseudo Relatives and RCs are string identical, yet their syntactic and semantic properties differ drastically.

- (4) a. Ho visto [_{sc}Gianni [che correva]] / He visto a Juan que corria / J'ai vu Jean qui courait
 b. *I saw John that ran
 c. I saw John running

Semantically, RCs denote individuals, and PRs propositions. Syntactically, the differences are extremely clear, among others:

⁴ Several accounts have been proposed to explain the asymmetries, e.g. the Tuning Hypothesis (Brysbaert & Mitchell 1996), Construal (Gilboy et al. 1995; Frazier & Clifton 1996), Predicate Proximity (Gibson et al. 1996), Anaphoric Binding (Hemforth et al. 1998, 2000b,a; Konieczny & Hemforth 2000), Implicit Prosody (Fodor 1998a,b).

⁵ *That-trace* effects are an obvious domain of variation (see Rizzi 2006, Rizzi and Shlonsky 2007 for discussion). An explicit attempt to link PRs and *that-t* effects in French is made in Koopman and Sportiche (2010).

- i. PRs, but obviously not RCs, are only available with embedded subjects (**Ho visto Gianni che Maria baciava EC / I saw Gianni that Maria kissed EC*);
- ii. PRs are subject to strict restrictions in Tense and Aspect restrictions: if I perceive an event, that event has to happen/unfold within the same temporal window of the perception. Therefore PRs have to match the Tense expressed in the matrix verb (5a,b) and have to occur in the imperfective form; the perfective would describe a completed event, which is not compatible with direct perception (compare also the use of gerundive in English, Spanish, Brazilian Portuguese and many other languages):

- (5) a. **Ho visto Gianni che correrà / I saw that Gianni that will run*
 b. **Ho visto Gianni che è corso a casa / I saw Gianni that ran home*

- iii. PR occur with *che/que/qui* but not with genuine Relative Pronouns (**Ho visto Gianni il quale correva*), which are restricted to RCs; PRs, but not RCs are available with proper names.

Several analyses of PRs have been proposed; importantly, they all recognize the fundamental difference between RCs and PRs.⁶

For concreteness, I will assume Cinque's (1995) analysis throughout. Cinque proposes a Small Clause (SC) account of PRs (parallel to Declerck's 1981 tripartite analysis of Small Clauses), which, among other things, offers a straightforward explanation of the ability of PRs to appear in all contexts in which SCs appear. I will assume this to be correct for Italian; however, the availability of PRs across languages, and often across speakers (e.g. in European Portuguese), varies considerably.

In the environment of perceptual verbs, PRs behave just like Small Clauses: they project as complements and are interpreted as *propositions*, i.e. direct perception of an event is reported: *I saw an event of John running*. Direct perception is the fundamental distinction between (3a) and *Ho visto che Gianni correva / I saw that John ran*; the latter can be inferred (from e.g. seeing John all sweaty), while the former can only be used when the event of John running was actually perceived. The same interpretive difference emerges in the English Acc-ing constructions, as the translations to the examples above clearly show.

The examples in (6) illustrate the different structural properties of the RC (a) and PR reading (b): crucially for us, in 6(a) the main verb takes a DP as its complement and the RC modifies that DP; at the interpretive level this is mapped as the perception of an entity/individual having certain additional restrictions specified in the RC. In 6(b), on the other hand, the matrix verb takes the whole Pseudo Relative Small Clause as its complement, and the DP is the subject of that clause; at the semantic level, we are reporting the perception of an event.

- (6) a. *RC reading*
 Ho [_{V'} visto [_{DP} NP₁ il ragazzo [_{CP} che *t* correva]]
- b. *PR reading*
 Ho [_{V'} visto [_{SC} [_{DP}₁ il ragazzo] [_{CP} che correva]]

⁶ On Pseudo Relatives see: Radford (1975); Graffi (1980); Burzio (1981, 1986); Kayne (1981); Taraldsen (1981); Declerck (1981, 1982); McCawley (1981); Auwera (1985); Guasti (1988, 1992, 1993); Rizzi (1992); Raposo (1989); Cinque (1992); Brito (1995); Labelle (1996); Rafel (1999); Côté (1999); Koenig & Lambrecht (1999); Koopman & Sportiche (2010), among others.

This distinction, which at first sight and in the context of a simple DP might appear minimal, reveals its importance once we consider complex DPs.

(7) a. *RC reading, Low Attachment*

I [V^{*} saw [DP₁ [NP₁ the son] [PP of [DP₂ the doctor [CP that ran]]]]]

b. *RC reading, High Attachment*

I [V^{*} saw [DP₁ the [NP₁ [N^{*} son [N^{*} [PP of [DP₂ the doctor]] [CP that ran]]]]]]]

c. *PR reading: DP1 only accessible subject*

I [V^{*} saw [SC [DP₁ the son [PP of [DP₂ the doctor]]] [CP that ran]]]

When the matrix verb takes an NP as its subject, the *che* clause is projected as a RC, and the parser has to choose whether to attach the RC to the first or the second NP (7a,b). However, when the matrix verb takes a SC as its complement, as in 7(c), the ambiguity is gone and the only possible subject for the embedded verb is DP1.

In what follows I will argue that when a PR is available, it will be preferred over an RC reading, and that this explains the variation in attachment preferences, both across languages and across structures.

3. Variable Syntax, Uniform Parsing

The main claim of this paper is that variation in Attachment Preferences, both across languages and syntactic structures, reduces to the availability of PRs: when PRs are projected, the verb takes the whole Small Clause, and not DP1 as an argument (or adjunct). In this situation, DP2 is not an accessible subject for the Small Clause: this gives the “illusion” of High Attachment, but actually, no preference is at stake here: DP1 is the only grammatical option.

The main question therefore is: how does the parser decide between an RC and PR reading of a *che* clause? I propose the following:

(8) *PR first Hypothesis*: When PRs are available, everything else being equal, they will be preferred over RCs because of Minimal Attachment.⁷

The rationale behind (8) is that PRs are less complex than RCs, both syntactically and semantically (in terms of the relative complexity of the semantic representation associated with each). We know on independent grounds (garden path effects) that RC readings are strongly dispreferred by the parser when an alternative subject–verb composition is available (*the horse raced past the barn fell*). Notice that the goal of the present study is to establish that certain parsing preferences are universal. Their characterization and origin, as Minimal Attachment or otherwise, is not essential to this goal. What’s relevant to the present point is that some principle akin to Minimal Attachment seems to be at stake: much like in other ambiguous strings, restrictive relatives are not the

⁷ *Minimal Attachment*: Attach incoming material into the phrase-marker being constructed using the fewest nodes consistent with the well-formedness rules of the language. “*Everything else being equal*”, in the context of experimental settings, relates mostly to possible syntactic priming effects: e.g. if half of your fillers are straightforward RCs, an RC reading will most likely be preferred; similarly, the use of straightforward Small Clauses as fillers should be avoided, as it is likely to affect the preferred reading. This factor, combined with the lack of access to the full list of items and fillers, makes it hard to evaluate previous experimental work at the light of the present proposal.

preferred parse in the absence of a context supporting the relevant presupposition. The choice of characterizing this principle of economy as operating over the depth of syntactic structures or over the relative complexity of presuppositions would seem to lead to the same results: both characterizations would favor a Small Clause reading here.

(9) *Predictions*: The hypothesis in (8) is easily falsifiable since it makes several strong predictions, a few of which are listed below:

1. High Attachment preferences will emerge whenever PRs are available;
2. Universal Low Attachment preferences will be observed with genuine restrictive RCs, i.e. when PRs are not available;
3. High Attachment preferences will also be observed in any context allowing an ambiguity between a reduced RC and a correlate of PR interpretation, e.g. the *Acc-ing* construction in English (*I saw the son of the doctor (that was) running*), Prepositional Infinitive Constructions in Portuguese (PIC, Raposo 1989: *Vi o filho do medico a correr*).

In the remainder of this paper, I show that these predictions are corroborated by both previous findings and novel experimental results.

3.1 Explaining variation across languages

As shown in Table 1, with the exception of Russian, there is an almost perfect correspondence between the availability of PRs and Attachment Preferences:

Language	Attachment	PRs
English	Low	•
Romanian	Low	•
Basque	Low	•
German	Low*	•
Russian	High*	•
Spanish	High	•
Italian	High	•
French	High	•
Dutch	High	•
Bulgarian	High	•
Serbo-Croatian	High	•
Japanese	High	•
Korean	High	•
Greek	High	•

Table 1: Attachment Preferences and PR availability

While the strength of the prediction is evident from the results summarized in Table 1, a few notes are in order. First of all, remember that several factors can determine the availability of PR: not only the semantic properties of the matrix verb (does the matrix V subcategorize for PRs?), but also the temporal and aspectual properties of the matrix and embedded verb. Notice further that different kinds of PRs exist (i.e. argument/adjunct) and different types of verbs differ in their ability to combine with them: perceptual verbs can take both argument and adjunct PRs, whereas verbs of the *incontrare/meet* kind only take adjunct PRs (see Cinque 1992 for discussion). For this reason to obtain a complete picture we

need to proceed to a more detailed study of previous results, one that takes into account the fine structural and semantic properties of the stimuli used. Secondly, notice that the literature on German produced contrasting results: traditionally, German is treated as High Attachment preference language, based on the work of Hemforth et al. (1998, 2000a,b); Konieczny & Hemforth (2000); more recently, however, Augurzky (2005) obtained a consistent Low Attachment preference in a series of online and offline experiments, and concluded, also on the basis of ERP results, that German is a Low Attachment Language. This contrast allows me to introduce a note of caution, which also applies to Russian: while PRs are widely attested in a variety of environments in certain languages, e.g. in Italian, their availability in other languages (e.g. Portuguese, and to a minor extent Greek) is subject to great variation, both regional, generational and often what appears to be purely individual.⁸

In order to strengthen these results, in-depth comparative work must be conducted, taking into account the various factors involved in the availability of PRs. This is especially true given that, even in those rare cases in which we do have access to the sentence stimuli used in the experiments conducted so far on attachment preferences, we still don't know what kind of fillers were used by the authors. This is particularly important in the light of what was said above (note 7) about syntactic priming. Yet, while we can't take this generalization at face value, it's hard not to be struck by the strength of the prediction and the variety of languages it correctly applies to.

3.2 Explaining variation across syntactic structures

As mentioned above, several authors have shown that the characteristic asymmetry in attachment preferences disappears in certain specific syntactic environments, i.e. speakers of HA languages, such as Spanish, display Low Attachment preference in those environments. A short selection of such environments is listed below (ex. 9-12):

(9) SUBJECTS (Hemforth et al. submitted)

- a. The maid of the actress (that was) sitting on the balcony is blonde
- b. La criada de la actriz que estaba sentada en el balcón es rubia

(10) NOMINALS⁹ (Gibson et al. 1996)

- a. The lamp near the painting of the house (that was) damaged by the flood
- b. La lámpara cerca de la pintura de la casa que fue dañada en la inundación

⁸ A second related issue is the following: some of the factors considered here might play a role even in languages that do not allow for PRs; e.g. when parsing a sentence starting with *I saw the boy...*, the parser will have to make a choice between two possible continuation at *the boy* – i.e., syntactically the parser will have the option to project the NP as the object of V or as the subject of a SC, the latter being the object of V; semantically, between the perceptual report of an entity or an event. The sentence, in fact, might continue as *I saw the boy running* or *I saw the boy you mentioned yesterday*. To clarify this issue, we are currently comparing attachment preferences with Verbs (and Nouns) that take/don't take SCs as complement in English.

⁹ PRs, in fact, are available in NP contexts in some languages (e.g. Italian) but not others (Spanish or Portuguese, see Rafel, 1999). This availability is limited to event-introducing nominal, e.g. *la foto di Gianni che corre è bella* / *the picture of John running is beautiful*.

- (11) TYPE OF P (De Vincenzi & Job 1993)
 a. Qualcuno ha sparato alla governante con l'attrice che stava seduta al balcone
 b. Someone shot the maid with the actress (that was) sitting on the balcony
- (12) UNAMBIGUOUS RELATIVE PRONOUNS (Fernandez 2003, p.31)
 Vi al hijo del medico el cual estaba en el balcón
I saw the son of the doctor who_{rel-pro} was on the balcony

Crucially, what these contexts have in common is their inability to introduce propositions, i.e. PRs are *not* available in any of these environments, and LA is correctly predicted. That the PR reading is not available in these contexts is well illustrated by the English version of the examples 10 and 12, in which we have to add a “*that was*”: even in the absence of the complementizer, the following string “sitting on the balcony” is still interpreted as a reduced relative clause (a generally dispreferred interpretation) and not as a Small Clause of the *Acc-ing* type. Notice that this pattern does not simply follow from position (subject vs. object) or category (N vs. V). As it will be shown below, what drives attachment preferences is the availability of PRs, i.e. the presence of a context capable to introduce propositions. Manipulating this property of the contexts changes this state of affairs, often quite dramatically:

- (13) PR COMPATIBLE SUBJECTS
 a. The maids of the actresses (*that were) running is quite an event
 b. La criada de la actriz que corre es un evento
- (14) PR COMPATIBLE NOMINALS
 L'immagine del figlio del medico che corre è davvero bella
The picture of the son of the doctor running is very beautiful

The *che* clause in (14), despite being embedded in a nominal, is ambiguous between a PR and RC reading: this is due to the fact that *picture of* NPs can introduce events. Even more to the point, in (13), due to the semantic and agreement properties of the matrix predicate *is an event*, the RC reading becomes agrammatical, and PR/SC is the only available interpretation despite it being embedded within a subject. Importantly, the experimental works cited above didn't make use of these special contexts.

Summing up, once the availability of PRs is taken into account, previous (often conflicting or confusing) results from the experimental literature on attachment preferences are amenable to a uniform explanation: as predicted, High Attachment is observed in a given language only in contexts that allow for a PR reading, whereas in all genuine RC contexts, Low Attachment preference prevails.

3.3 Novel experimental evidence

In a series of experiments on Italian, Spanish and Portuguese, developed together with my colleagues at CLUNL, we manipulated the availability of PRs by exploiting different grammatical constraints. The experiments employ standard questionnaires with complex NPs and a modifying *che/that* clause, and are designed to check for attachment preferences. The factors manipulated include:

type of RC, i.e. position of extraction (subject-object), type of Verb or Nominal (event vs. state) and position of the complex NP (Center Embedding vs. Right Branching)¹⁰. The results, reported in Grillo and Costa (2012), consistently support the present hypothesis: a significant difference was observed between the PR and no-PR conditions; in particular, HA preference was observed in all conditions allowing for a PR reading of the *che* clause, whereas LA preferences emerged in all conditions in which the availability of PRs was excluded on grammatical grounds.

In a third experiment (reported in Grillo, Fernandes and Costa in preparation), we tested Prepositional Infinitive Constructions in Portuguese, a structure that has very similar properties to PRs (cf. Raposo 1989; Cinque 1995) when it appears in eventive contexts (e.g.: *O João viu o filho do medico a correr* / *John saw the son of the doctor running*), and which can, or has to, be interpreted as a reduced relative clause in certain environments (e.g. in the contexts of verbs or nominals introducing a state: *O João vive com o filho do medico a correr* / *John lives with the son of the doctor running*). Once again, the results obtained show a very clear HA preference (72.9% HA) in the PR condition (although it might be more precise to call it Small Clause condition or PIC condition in this case) and LA preference in the no-PR condition (37.8% HA).

4. Final remarks

The finding that speakers of different languages demonstrate different attachment preferences for RCs in complex NP contexts raised a serious problem for a universal theory of processing, a complicated riddle for the otherwise strong generalization for locality in parsing and, as a consequence, very serious issues for a theory of language acquisition.

The problems raised by these asymmetries, of course, only stand insofar as the languages and constructions under scrutiny are uniform from a structural point of view. A ubiquitous assumption in the literature on attachment preferences is that this is indeed the case. I have shown that this assumption is wrong: some languages (Spanish, Italian, Dutch...) allow for a Pseudo Relative reading of the relevant string (NP P NP C), while in others (English, German, Romanian) this string can only be interpreted as a genuine Relative Clause.

I have also argued that this grammatical difference can account for attachment preference asymmetries both across languages and across syntactic structures.

The hypothesis I've entertained is that when a PR reading is available, it will be preferred over the RC reading for Minimal Attachment, the latter reading being more complex in terms of syntactic structure and amount of presupposition required.

Since when PRs are projected, attachment to NP1 is the only grammatical option, the hypothesis predicts that HA preferences will obtain when they are available. The hypothesis also predicts that LA preferences will be observed whenever we are dealing with genuine RCs, i.e. when PRs are not available.

Drawing from both previous and novel experimental results, I have shown that this is indeed the case: the availability of PRs allows us to predict attachment preferences both across languages and across structures. These results strengthen the idea that locality is a universal principle of processing and more generally support a theory of processing as a set of universal, innate principles.

¹⁰ I underlined the conditions that do *not* allow for a PR reading.

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